NLC NATIONAL LEAGUE OF CITIES

CENTER FOR CITY SOLUTIONS

HARD-TO-FILL INFRASTRUCTURE JOBS:

A Challenge to Building Our Future

NLC NATIONAL LEAGUE OF CITIES
CENTER FOR CITY SOLUTIONS

About the National League of Cities

The National League of Cities (NLC) is the voice of America's cities, towns and villages, representing more than 200 million people. NLC works to strengthen local leadership, influence Federal policy and drive innovative solutions.

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Foreword

For more than half a decade, the National League of Cities has called on Congress and the Administration to invest wholly in our nation's infrastructure -- our roads, bridges, water systems, broadband networks and the local workers who will build and maintain these critical local assets. Now, as we sit on the cusp of a historic investment in our nation's infrastructure through the bipartisan Infrastructure Investment and Jobs Act (IIJA), cities, towns and villages across the country are ready to address the critical, foundational needs of their communities and build towards the future.

But we know that we can't build and maintain these assets without people. Even before the COVID-19 pandemic wreaked havoc on our local economies, our nation's infrastructure businesses were challenged to find the skilled labor needed to fill their open positions.

Today, as millions of workers – particularly workers of color, young people, woman and immigrants – have lost jobs that aren't coming back, an equitable recovery for these residents, for local businesses and for our communities would be best served by an investment in workforce training. These investments will help ensure that the jobs across infrastructure sectors that will be created by the historic federal infrastructure legislation will be filled and that shifting business demands in other sectors can be met.

As this report so clearly shows, infrastructure jobs are harder to fill than jobs in other industries, across all regions and all city sizes. As municipalities prepare to put infrastructure dollars to work, we must ensure that our worker supply meets business demand. Local leaders are already thinking creatively about how to scale-up infrastructure training programs – in Louisville, San Antonio, Camden, Milwaukee and beyond. We are working to ensure that the federal government comes to the plate to finish the job and invest at-scale in the workforce we need to build and maintain our nation's critical infrastructure assets.

CLARENCE E. ANTHONY
CEO and Executive Director
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Introduction

Our nation's infrastructure is set to get a big, much needed boost from the Federal government's American Rescue Plan Act and bipartisan Infrastructure Investment and Jobs Act. These new funding streams not only target expansion, maintenance, and remediation of a wide range of infrastructure systems and assets, from broadband and water systems to lead pipes and solar energy but will spur an unprecedented number of new infrastructure jobs.

These investments include both traditional brick-and-mortar spending along with new smart infrastructure like broadband, and have the potential to bring long-term economic returns, increasing Gross Domestic Product (GDP) by as much as $320 billion per year.[1] Across our nation's cities, towns and villages, this means a growing infrastructure workforce, improved resilience and a greater ability to meet the challenges of the future.

An infrastructure job is one in which the work required is related to the design, construction or maintenance of infrastructure. Despite the significant potential that infrastructure jobs hold for economic recovery and the immense anticipated demand for workers, little is known about how well our nation's workforce is aligned, willing and ready to take on these new jobs. Based on a proprietary dataset of job postings in the U.S. from January – April 2021, this analysis examines the open and close date of all infrastructure jobs to determine those that take longest, and are hardest, to fill in our current pandemic/post-pandemic economy.

An infrastructure job is one in which the work required is related to the design, construction or maintenance of infrastructure.

Key findings from this analysis indicate that:

- Infrastructure jobs are already a sizeable share of all job postings;
- Infrastructure jobs are harder to fill than jobs in other industries;
- Infrastructure jobs that take the longest to fill also pay the highest wages; and
- Infrastructure hiring challenges are relatively consistent across cities and regions with the starkest challenges in the Northeast.

Assessing the infrastructure labor market through the lens of hard-to-fill job postings provides new insights into our understanding of potential workforce challenges that may impede or delay the success of infrastructure funding priorities. Difficulty in filling certain jobs may be explained by anything from worker shortages to lack of on-ramps to career pathways and misalignment between workforce programs and industry demand. Given the range of factors potentially affecting employers' ability to fill infrastructure jobs, this analysis suggests that policy makers and partners carefully consider why key jobs are hard-to-fill in their communities and regions and ensure that workforce strategies are part of their overall infrastructure planning.

Infrastructure Jobs Account for Large Share of Job Postings

Between January and April 2021, businesses in the U.S. posted over 6.2 million jobs. Nearly 650,000 or over 10% of them were infrastructure related (**figure 1**).

An infrastructure job is one in which the work required is related to the design, construction or maintenance of infrastructure. Using this definition, this analysis classifies all U.S. Bureau of Labor Statistics (BLS) occupations as either infrastructure or non-infrastructure. This analysis classifies 291 occupations as infrastructure related.

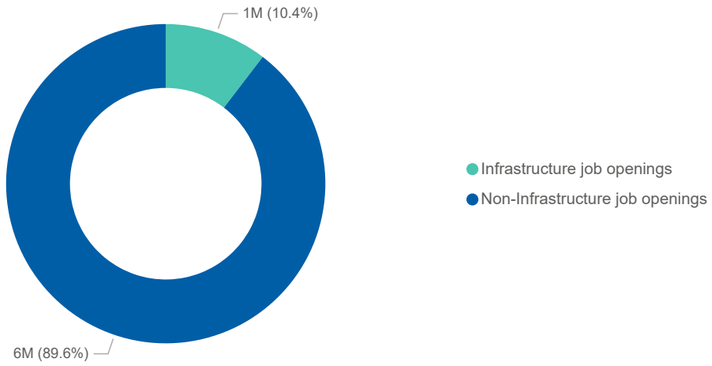
Infrastructure job postings are sorted into 10 major groups (**figure 2**).

Most infrastructure job postings this year belong to the Transportation and Material Moving; Installation, Maintenance and Repair; Architecture and Engineering; or Production occupation groups. Together, these four occupation groups account for more than three in four infrastructure job postings. The largest share of these infrastructure job postings is in the Transportation and Material Moving occupation group.

Figure 3 illustrates occupations and major groupings of occupations with the highest number of job openings.

FIGURE 1

Share of Job Postings



6.2 MILLION JOBS POSTED

between January and April 2021

FIGURE 2

Share of infrastructure job postings by occupation group

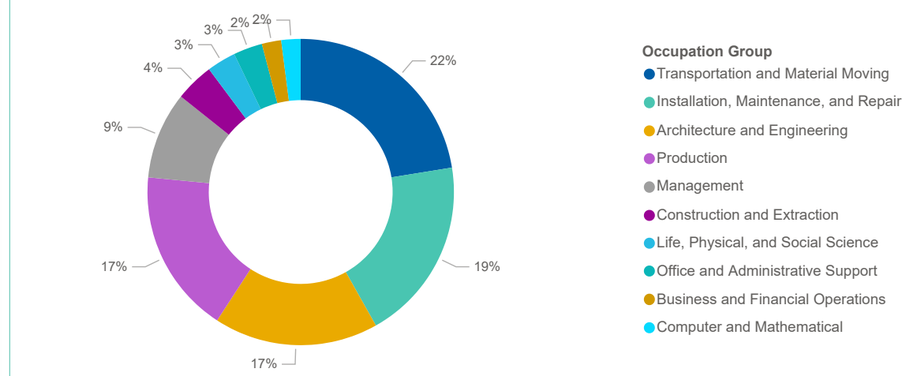


FIGURE 3

Infrastructure Jobs by Occupation Group

TRANSPORTATION AND MATERIAL MOVING

- Heavy and Tractor-Trailer Truck Drivers
- Light Truck Drivers
- Laborers and Freight, Stock, and Material Movers
- Industrial Truck and Tractor Operators
- Packers and Packagers

INSTALLATION, MAINTENANCE, AND REPAIR

- Aircraft Mechanics and Service Technicians
- Audiovisual Equipment Installers and Repairers
- Automotive Service Technicians and Mechanics
- Avionics Technicians
- Bus and Truck Mechanics and Diesel Engine Specialists

PRODUCTION

- First Line Supervisors of Production and Operating Workers
- Production Workers
- Inspectors, Testers, Sorters, Samplers and Weighers
- Assemblers and Fabricators
- Machinists

ARCHITECTURE AND ENGINEERING

- Industrial Engineers
- Mechanical Engineers
- Electrical Engineers
- Civil Engineers
- Industrial Engineering Technologists and Technicians

Infrastructure Jobs are Harder to Fill than Other Types of Jobs

To assess how difficult it is to fill an infrastructure job, we analyze two measures:

- the time between opening and closing of job postings and
- the share of jobs by occupational group that take longer than expected to fill (see **methodology** for more details).

These "time-to-fill" metrics are commonly used by human resources professionals to understand how well the labor market is suited to in-demand industries. When compared to non-infrastructure jobs, we find that infrastructure jobs are harder to fill. The median time-to-fill an infrastructure job is 23 days, compared with 19 days for a job not related to infrastructure (**figure 4**.) Additionally, 30% of infrastructure jobs are hard-to-fill, or take longer than expected to fill, whereas only 24% of all other jobs are hard-to-fill (**figure 5.**)

FIGURE 4

Median Time-to-Fill (number of days)

FIGURE 5

Share of Job Postings that are Hard-to-Fill

Infrastructure Jobs That Take Longest to Fill Also Pay Highest Wages

Infrastructure jobs in the Management occupation group take the longest to fill. These include jobs ranging from Computer and Information Systems Managers and Construction Managers to Quality Control Systems Managers and Industrial Production Managers. The median time-to-fill infrastructure-related Management positions was 29 days (**figure 6**). These positions also have the highest share of jobs that take longer than expected to fill, with 32% of these positions open for more than 45 days (**figure 7**). Similarly, Architecture and Engineering occupations have a median time-to-fill of 29 days, with one in four of those jobs taking longer than expected to fill (more than 56 days).

32%

Of infrastructure-related management positions are open for more than 45 days.

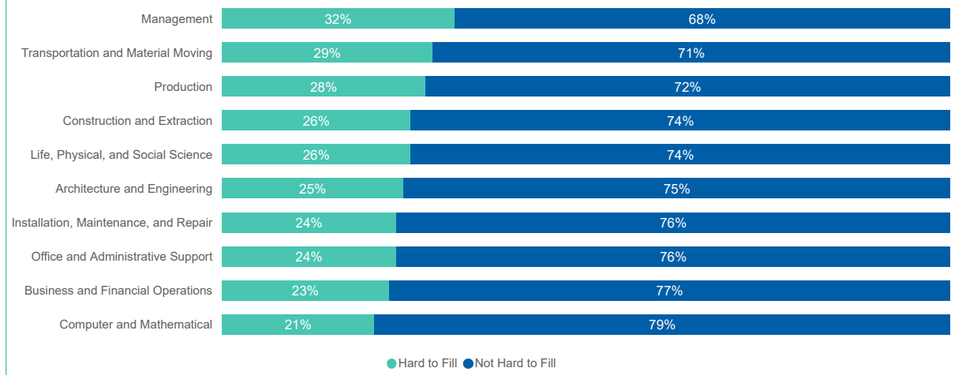
FIGURE 6

Median Time-to-Fill and Median Hourly Wage for Infrastructure Jobs by Occupation group

	Median Time-to-Fill (days)	Median Hourly Wage
Architecture and Engineering	29.0	$39.98
Management	28.8	$52.77
Installation, Maintenance, and Repair	24.7	$23.44
Construction and Extraction	23.0	$23.37
Production	22.8	$18.00
Computer and Mathematical	22.4	$43.92
Life, Physical, and Social Science	22.0	$33.54
Business and Financial Operations	20.5	$34.73
Transportation and Material Moving	18.2	$16.38
Office and Administrative Support	17.0	$18.62

FIGURE 7

Share of Infrastructure Jobs that are Hard-to-Fill by Occupation Group



According to a 2021 study by the Georgetown University Center on Education and the Workforce, occupations in these two groups tend to require a higher level of education. More than two in three Management occupations require a bachelor's degree or higher; 60% of Architecture and Engineering occupations require a bachelor's degree or higher.[2]

Additionally, occupations within the Management occupation group pay a median hourly wage of $53 and a median annual wage of $109,760 (nearly 200% of the median wage for all occupations). In the next hardest to fill occupation group, Architecture and Engineering, the median hourly wage is $40, and the median annual wage is $83,160. While these occupations are harder to fill and require more specialized education and training, they also pay higher than average wages, creating a pathway to stability and prosperity.

Infrastructure Hiring Challenges Evident Across Cities and Regions

Across all regions of the U.S., infrastructure jobs take longer to fill than non-infrastructure jobs. This difference is more pronounced in the Northeast and West, where infrastructure jobs take at least six days longer to fill on average than non-infrastructure jobs (**figure 8**). In the Midwest and South, the difference in time-to-fill is closer to two or three days.

While it takes slightly longer to fill an infrastructure job in the Northeast (27 days) than it does in the West (25), Midwest (23), or South (22), the overall share of infrastructure job postings that are hard-to-fill is roughly one in four jobs across all regions. Similarly, when assessing time-to-fill and share of hard-to-fill infrastructure postings by city size, significant differences do not emerge (**figure 9**).

FIGURE 8

Infrastructure Job Postings Profile by Region

	Infrastructure occupation time to fill	Non-infra-structure time to fill	Difference in time to fill	Percent of infrastructure jobs hard to fill
Northeast	26.7	20.4	6.3	27%
West	24.5	18.5	6.0	25%
Midwest	23.0	20.4	2.6	24%
South	22.1	19.0	2.1	25%

FIGURE 9

Infrastructure Job Postings by City Size

	Infrastructure occupation time to fill	Non-infrastructure time to fill	Difference in time to fill	Percent of infrastructure jobs hard to fill
< 10k	22.8	18.7	4.1	30%
10k - 50k	23.7	18.4	5.3	30%
50k - 100k	24.2	19.2	5.0	31%
100k - 300k	22.6	18.9	3.7	30%
300k +	24.1	20.6	3.5	30%

Discussion and Implications

Hard-to-fill infrastructure jobs are the result of broader trends in the economy, as well as challenges specific to the infrastructure field. Overall, labor shortages and misalignment between workforce development and industry demand are creating friction between workers and available jobs. Additional factors such as insufficient access to career pathways and significant retirements of skilled and semi-skilled workers are affecting infrastructure jobs more acutely.

Despite a record 9.2 million job openings in May 2021, there are still 7 million fewer people employed now than before the pandemic.[3] This dynamic creates increased competition for workers resulting from:

- Continuing fears of infection as COVID-19 cases continue to rise across the country;
- Logistical barriers related to remote childcare and education;
- Increased retirements particularly concentrated in the infrastructure industry; and
- Changing norms and perspectives on work, to the extent that many infrastructure occupations do not always offer the same flexibilities as other high-demand occupations (such as the ability to telework).[4]

Retirements of skilled and semi-skilled workers are likely to become a major challenge for the infrastructure field. At last estimate, over 2.7 million infrastructure workers have retired over the last decade.[5] Manny Rodriguez, Executive Director of Revolution Workshop (a Chicago-based Construction and Manufacturing workforce development organization), stresses the importance of investing in education and upskilling in these sectors, especially for traditionally underserved groups, because "millions of skilled blue-collar workers—many of them older white men—[are] close to retirement."[6] While the overall labor force is expected to grow over the next decade, labor force participation is expected to continue to decline, largely due to the retirements of baby boomers and job growth in the country.[7]

Further amplifying the recruitment challenge within the infrastructure sector is lack of access to on-ramps to these career pathways. Moving individuals into the infrastructure sector who have currently or historically been disconnected from those careers requires not only access to skills training, but also consideration of alternatives to credentials such as on-the-job training and apprenticeships. These opportunities offer experience and exposure to advanced positions within the field while providing a living wage. These alternatives also allow for career advancement and open-up more entry-level positions, which have lower barriers to entry. While career pathways within infrastructure jobs are not linear, there are significant opportunities to transfer skills and experience across the sector for advancement.

To replace retired skilled and semi-skilled infrastructure workers, communities can either upskill their existing talent pool to meet their needs or attract talent from outside the community. Over the last few decades, people in the United States have become increasingly less likely to migrate within the country due to desires to stay closer to family and pre-existing social structures.[8] Fewer people are moving across the country for new employment opportunities, making it very hard to attract outside talent. This makes talent shortages in highly specialized fields, like environmental engineering, much more acute—especially in areas where educational attainment and workforce skills are lagging.

While most infrastructure jobs do require education and training beyond high school, 60 percent of the needed infrastructure jobs require only six months of training or less.[9] Most Construction jobs only require a high school diploma and on-the-job training; however, there is currently a Construction worker shortage of about one million workers in the United States.[10]

At last estimate, over

2.7 MILLION

Infrastructure workers have retired over the last decade.

-Brookings Institution

60%

Of infrastructure jobs require only 6 months of training or less.

-Georgetown University, Center on Education and the Workforce

Over time, there has been disinvestment in training the workforce for these skills and in primary education of the benefits of a career in skilled trades, manufacturing or many of the sectors within the infrastructure space. This has coincided with a lack of attention to, and declining investments in, career and technical education at the middle & high school levels from the federal government, with an increased focus on academic preparation alone.[11]

Further, employers (who generally provide most short-term training opportunities) have also been investing less in workforce preparation. As a result, the nation's capacity to rapidly re-train workers for in-demand industries is incredibly low. At the same time, by some estimates, there are millions of Americans without a college degree who have the skills to succeed in higher-wage work, but without the means to easily convey what skills they have to employers.[12]

Specifically, leveraging their roles as conveners and trusted stakeholders who often sit at the intersection of workforce and economic development, city leaders can:

- **Convene employers and education and training partners** to align existing and create new short-term training offerings targeted toward individuals who have currently or historically been disconnected from education and training opportunities that lead to high quality careers, including internships, apprenticeships, and city-sponsored summer youth employment programs that provide a pathway into careers.
- **Leverage real-time labor market information** to prioritize in-demand occupations, particularly in the infrastructure sector, and map skills adjacency between declining industries and growing industries to help residents and local businesses understand how skills can be transferable.
- **Identify and address any structural labor market barriers** that prevent certain populations from accessing education and training opportunities that lead to high quality careers, such as educational attainment, equitable wages, and hiring practices, as well as childcare, transportation, housing, food, and other basic needs that can prevent workers from accessing in-demand jobs.
- **Empower your local workforce development board** or related entity to set goals, coordinate partners, and lead change in this area.

Addressing infrastructure workforce challenges will require policy makers at all levels to encourage workforce boards, schools, colleges and universities to proactively engage their local employers to design programs that meet local labor market needs. It will also require employers to be active co-investors in designing solutions for their talent shortages, and to look to non-traditional sources of talent.

Conclusion

According to early estimates, an infrastructure investment at the scale of the bipartisan Infrastructure Investment and Jobs Act, which includes $550 billion in new Federal investment in America's infrastructure, would create or save 15 million jobs over the next decade.[13,14] However, the legislation does not contain a proportional investment in skills training to ensure a pipeline of workers are ready to build and maintain these critical assets. With Federal funding for workforce development having been cut by nearly 40% over the last two decades, the U.S. invests just .1 percent of GDP on active labor market policies, less than any other industrialized country except for Mexico.[15,16]

Our analysis demonstrates that within this context, infrastructure jobs are already harder to fill than those in other fields. Of over six million job postings in early 2021, nearly 12% are related to infrastructure and take about four days longer to fill than others. This finding holds true across regions and across city sizes. As such, the federally funded workforce system and the broader workforce community will be faced with mobilizing an under-resourced system to meet the employer demands that will come as a result of a federal investment in our national infrastructure systems.

CITY PROFILE

San Antonio, TX

2019 MARKED THE SEVENTH CONSECUTIVE year where more than 500,000 people moved to Texas.[17] Expecting one million new residents by 2040, the City of San Antonio is one of the major cities in Texas that has recently experienced a surge in population growth.[18] The development of adequate infrastructure in response to a growing population became one of San Antonio's main goals of the city's comprehensive development plan, SA Tomorrow. The plan includes maintaining and updating existing transportation and sewage systems, as well as upgrading existing stormwater infrastructure with green stormwater management solutions.

Despite plans to significantly overhaul the city's infrastructure, semi-skilled and skilled labor shortages in Construction and Manufacturing limit San Antonio's capacity to carry out these plans on budget and time.[19,20] Despite these challenges, the city has a history of sector-focused workforce investments. Among the most prominent of these investments is Project QUEST, a collaborative effort between the San Antonio government, the county government, and local and county-level economic development organizations.[21]

Project QUEST is a nationally recognized multi-sector, employer-driven model with a 29-year history of successfully planning and implementing training programs for over 7,000 residents in high-demand, high-paying jobs that enhance the economic competitiveness of San Antonio. Occupational training programs are one to two years in length across three key sectors: Manufacturing and Trades, Healthcare and Information Technology. All training and placement efforts are linked to specific employment sectors with promising wage advancement potential. The programs offered are college-based studies and most are directed toward associate degrees from one of the area community colleges or professional training institutes. Some courses of study are based on certificate programs approved by the State of Texas and various licensing boards and, in some cases, may be offered through regional, state-certified private training facilities. Project QUEST has achieved large, statistically significant earnings impacts that have been sustained, demonstrating the potential long-term rewards of making substantial skills investments in low-income individuals.[22]

CITY PROFILE

Camden, NJ

CAMDEN, NJ IS A COMMUNITY THAT has been marred by high poverty, poor environmental quality and vulnerable water infrastructure. Camden has a combined sewer system—a system that shares underground piping networks that direct both sewage and stormwater to a central treatment system before being discharged into a waterway. Camden's combined sewer systems often overflow when the city experiences significant snowmelt or heavy rainfall.[23] These overflows are a major contributor to excess brownfields (developed land that is unused due to waste contamination) found in Camden.[24]

In response to these challenges, local leaders are pioneering collaborative solutions focused on green infrastructure. The Camden County Municipal Utilities Authority (CCMUA), the region's primary wastewater utility, has partnered with a variety of groups to develop projects and initiatives that improve existing water services while promoting green infrastructure development. Some of these initiatives, like PowerCorps Camden, help local residents access new jobs, offering workforce opportunities to underserved citizens of Camden.[25]

Camden's Center for Family Services, in partnership with the state and local governments, launched the PowerCorps Camden program in December 2015, with the goals to improve outcomes for opportunity youth, 16–24-year-olds who are not working and are not in school, and to improve green infrastructure in Camden City. PowerCorps Camden is a three-year AmeriCorps program that provides 60 young adults per year with job training and career readiness opportunities. The prorgam's members partner with the city and other groups to work on projects focused on Camden's green infrastructure network, like stormwater and park management and remediation for contaminated lots. Since 2015, PowerCorps Camden participants have treated over 440 acres of contaminated land each year.[26]

CITY PROFILE

Milwaukee, WI

MILWAUKEE HAS A LONG HISTORY AS an industrial manufacturing community. With the current growth in Manufacturing, combined with an aging workforce and diversification of the regional economy, the city experiences broad skills shortages across key infrastructure sectors. This skills shortage not only impacts the private sector but also the public sector. For example, the city's water utility, the Milwaukee Water Works, is expected to see workforce retirements and turnover of roughly 40% in the next five years.[27]

The city, under the leadership of Mayor Tom Barrett, has made strong investments in enhanced skills training and education to ensure that residents can connect to the infrastructure jobs available in the community. These investments include:

- The Mayor's Manufacturing Partnership is a collaboration between the city, Employ Milwaukee, Wisconsin Regional Training Partnership /BIG STEP, technical colleges and economic development groups aimed at eliminating the manufacturing skills gap by training Milwaukee job seekers with the skills needed to achieve a career pathway in Manufacturing.[28] More than 800 participants have been served through this program.
- The Cream City YouthBuild program works with students who have dropped-out of high school to attain their diploma while receiving occupational-skills training in the construction sector.[29] The program prepares these young people for career and employment in Construction.
- The City of Milwaukee utilizes local hire provisions through its Residents Preference Program to help underemployed and unemployed residents gain access to employment opportunities in city-funded construction and private development contracts.[30]

CITY PROFILE

Louisville, KY

LOUISVILLE'S CENTRAL GEOGRAPHIC location within the United States provides a strategically strong position for moving products and people across the country and beyond via its airport, ports, railways and interconnected highway system. Ensuring maintenance and support of these systems is critical to maintaining the economic competitiveness of the city.

The City, under the leadership of Mayor Greg Fischer, in addition to ensuring that there is a steady supply of workers to meet employer demands across these infrastructure sectors, is also looking deeply at equity in employment and business contracts within the infrastructure sector.

- The Equity in Contracting and Procurement Task Force is working to implement measures to ensure that the approximately $5 billion in public and private capital infrastructure investments anticipated over the next five years is fairly distributed among local Black-owned and other minority-owned businesses.[31]
- Kentuckiana Builds, a partnership between KentuckianaWorks, the local workforce development board, and the Louisville Urban League along with the Education and Workforce Development Cabinet of the Commonwealth of Kentucky delivers sector-based training, job placement, connections to apprenticeships and advanced training, and work incentives to increase diversity within the Construction sector.[32] In the first five years of the program they trained and placed almost 300 people – mostly people of color and a strong number of women – into Construction jobs.
- The KY Manufacturing Career Center, a sector-based, federally funded workforce training center, works to connect local residents to the growing Manufacturing and Logistics industries in Louisville including Certified Forklift Technician training in collaboration with the Jefferson Community and Technical College.[33]

Data and Methodology

Data

NLC sourced current data on job postings from LinkUp. LinkUp collects data on job postings directly from company websites. The location of the job posting, creation date, delete date, job description, and company information are documented in their dataset. LinkUp also connects every job posting t o an Occupational Information Network (O*NET) classification code. O*NET codes classify occupations based on the knowledge, skills, activities, and context of the work.

Defining infrastructure jobs

We classify all 1,016 O*NET codes as either infrastructure related or not. Using the bipartisan infrastructure spending framework as a guide to the definition of infrastructure, the occupations were assessed on whether they are related to infrastructure design, construction or maintenance.[34] Using this methodology, 291 O*NET codes are categorized as infrastructure related. Using those categories, 10.4% of all job postings are infrastructure related and 89.6% are not. Infrastructure job postings are then organized according to the 23 major groups of occupations classified by the U.S. Bureau of Labor Statistics. Ten of these major groups contain at least 1% of the infrastructure occupations. See the **appendix** for totals of infrastructure job postings by job family and occupation.

O*NET codes are preferable to NAICS or other sector classifications because they are directly related to the content of the work as opposed to the sector of the company. Sector classifications often include large swaths of both infrastructure and non-infrastructure related jobs. For any given company, sector classifications may classify too many or too few job postings as infrastructure-related. For example, in the company sector, a Marketing Specialist for a construction company would be included while an Industrial Engineering Technologist in the real estate sector would not be. Therefore, this analysis focuses specifically on jobs related to infrastructure as opposed to all jobs in infrastructure related sectors.

Measuring hard-to-fill

The median time-to-fill is used as the metric of analysis along with a share of hard-to-fill metric. A job is hard-to-fill if its posting duration is longer than the third quartile marker for time-to-fill of all occupations within its occupation group, or job family. For example, a job posting for occupation within Architecture and Engineering is considered hard-to-fill if it takes longer than 56.3 days to fill, and a job posting for an occupation within Building and Grounds Cleaning and Maintenance is hard-to-fill if it takes longer than 36.2 days to fill (**figure 10**).

FIGURE 10

Summary of Time-to-Fill (in days) by Occupation Group

Occupation	min	Q1	median	Q3	max
Architecture and Engineering	0.0	12.2	28.8	56.3	176.0
Business and Financial Operations	0.0	8.2	20.8	44.7	179.4
Computer and Mathematical	0.0	10.8	28.5	55.3	180.1
Construction and Extraction	0.1	10.4	22.8	46.6	174.6
Installation, Maintenance, and Repair	0.0	11.8	26.7	50.4	179.3
Life, Physical, and Social Science	0.0	8.1	21.3	46.9	175.9
Management	0.0	7.2	21.0	45.0	179.5
Office and Administrative Support	0.0	8.0	18.6	36.9	180.3
Production	0.0	8.1	20.6	42.5	178.9
Transportation and Material Moving	0.0	6.2	15.3	35.1	180.5

Appendix

Number of Infrastructure Job Postings by Occupation and Occupation Group

Architecture and Engineering

Industrial Engineers	32,809
Mechanical Engineers	12,973
Electrical Engineers	10,900
Civil Engineers	10,642
Industrial Engineering Technologists and Technicians	9,989
Aerospace Engineers	8,704
Electronics Engineers, Except Computer	6,673
Environmental Engineers	3,879
Civil Engineering Technologists and Technicians	2,861
Computer Hardware Engineers	2,801
Mechanical Engineering Technologists and Technicians	1,200
Architects, Except Landscape and Naval	1,039
Materials Engineers	898
Chemical Engineers	892
Bioengineers and Biomedical Engineers	689
Energy Engineers, Except Wind and Solar	686
Mechanical Drafters	594
Surveyors	580
Electro-Mechanical and Mechatronics Technologists and Technicians	561
Nuclear Engineers	533
Non-Destructive Testing Specialists	520
Fire-Prevention and Protection Engineers	519
Environmental Engineering Technologists and Technicians	516
Petroleum Engineers	507
Transportation Engineers	272
Mining and Geological Engineers, Including Mining Safety Engineers	228
Engineering Technologists and Technicians, Except Drafters, All Other	185
Mechatronics Engineers	182
Cartographers and Photogrammetrists	155
Aerospace Engineering and Operations Technologists and Technicians	105
Engineers, All Other	58
Photonics Engineers	51
Solar Energy Systems Engineers	49
Fuel Cell Engineers	28
Robotics Technicians	26
Photonics Technicians	25
Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	6
Microsystems Engineers	6
Robotics Engineers	6
Wind Energy Engineers	6
Electrical and Electronic Engineering Technologists and Technicians	4
Automotive Engineers	3
Marine Engineers and Naval Architects	3
Surveying and Mapping Technicians	2
Architectural and Civil Drafters	1
Automotive Engineering Technicians	1

Business and Financial Operations

Logisticians	10,409
Cost Estimators	2,052
Logistics Analysts	396
Sustainability Specialists	281
Logistics Engineers	28

Computer and Mathematical

Operations Research Analysts	13,047
Biostatisticians	36
Mathematicians	23
Mathematical Science Occupations, All Other	1

Construction and Extraction

First-Line Supervisors of Construction Trades and Extraction Workers	8,613
Electricians	5,211
Construction Laborers	3,415
Construction and Building Inspectors	2,406
Operating Engineers and Other Construction Equipment Operators	2,041
Highway Maintenance Workers	1,350
Service Unit Operators, Oil and Gas	736
Painters, Construction and Maintenance	569
Solar Photovoltaic Installers	564
Sheet Metal Workers	557
Paving, Surfacing, and Tamping Equipment Operators	455
Rail-Track Laying and Maintenance Equipment Operators	342
Roustabouts, Oil and Gas	266
Insulation Workers, Floor, Ceiling, and Wall	167
Helpers--Electricians	144
Rotary Drill Operators, Oil and Gas	126
Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	122
Helpers--Extraction Workers	109
Structural Iron and Steel Workers	94
Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	76
Cement Masons and Concrete Finishers	73
Insulation Workers, Mechanical	57
Boilermakers	56
Extraction Workers, All Other	54
Septic Tank Servicers and Sewer Pipe Cleaners	54
Roofers	52
Pipelayers	51
Glaziers	43
Solar Energy Installation Managers	42
Construction and Related Workers, All Other	36
Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	30
Helpers, Construction Trades, All Other	27
Weatherization Installers and Technicians	24
Brickmasons and Blockmasons	15
Reinforcing Iron and Rebar Workers	14
Drywall and Ceiling Tile Installers	13
Helpers--Carpenters	12
Tapers	12
Plumbers, Pipefitters, and Steamfitters	10
Elevator and Escalator Installers and Repairers	7
Derrick Operators, Oil and Gas	6
Pile Driver Operators	5
Plasterers and Stucco Masons	5
Fence Erectors	3
Floor Layers, Except Carpet, Wood, and Hard Tiles	3
Segmental Pavers	3
Stonemasons	3
Tile and Stone Setters	3
Helpers--Roofers	2
Underground Mining Machine Operators, All Other	2
Rock Splitters, Quarry	1

Installation, Maintenance, and Repair

Maintenance and Repair Workers, General	57,020
First-Line Supervisors of Mechanics, Installers, and Repairers	26,009
Bus and Truck Mechanics and Diesel Engine Specialists	11,879
Industrial Machinery Mechanics	7,647
Telecommunications Equipment Installers and Repairers, Except Line Installers	7,528
Security and Fire Alarm Systems Installers	2,990
Aircraft Mechanics and Service Technicians	2,192
Electrical Power-Line Installers and Repairers	1,384
Mobile Heavy Equipment Mechanics, Except Engines	1,361
Electrical and Electronics Repairers, Commercial and Industrial Equipment	1,150
Audiovisual Equipment Installers and Repairers	1,016
Installation, Maintenance, and Repair Workers, All Other	715
Automotive Service Technicians and Mechanics	700
Helpers--Installation, Maintenance, and Repair Workers	650
Wind Turbine Service Technicians	579
Telecommunications Line Installers and Repairers	540
Avionics Technicians	474
Electronic Equipment Installers and Repairers, Motor Vehicles	381
Outdoor Power Equipment and Other Small Engine Mechanics	327
Control and Valve Installers and Repairers, Except Mechanical Door	133
Motorboat Mechanics and Service Technicians	123
Rail Car Repairers	114
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	111
Mechanical Door Repairers	89
Millwrights	61
Electric Motor, Power Tool, and Related Repairers	59
Maintenance Workers, Machinery	45
Commercial Divers	44
Riggers	43
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	29
Precision Instrument and Equipment Repairers, All Other	29
Signal and Track Switch Repairers	25
Electrical and Electronics Installers and Repairers, Transportation Equipment	16
Manufactured Building and Mobile Home Installers	3
Refractory Materials Repairers, Except Brickmasons	3
Geothermal Technicians	1

Life, Physical, and Social Science

Chemists	4,391
Environmental Scientists and Specialists, Including Health	4,344
Quality Control Analysts	2,555
Chemical Technicians	1,806
Biochemists and Biophysicists	1,275
Urban and Regional Planners	1,263
Atmospheric and Space Scientists	1,125
Materials Scientists	582
Microbiologists	471
Geoscientists, Except Hydrologists and Geographers	386
Physicists	312
Industrial-Organizational Psychologists	189
Hydrologists	182
Nuclear Monitoring Technicians	115
Climate Change Policy Analysts	25
Remote Sensing Scientists and Technologists	22
Life, Physical, and Social Science Technicians, All Other	16
Transportation Planners	15
Environmental Restoration Planners	14
Geneticists	12
Remote Sensing Technicians	12
Molecular and Cellular Biologists	11
Life Scientists, All Other	4
Physical Scientists, All Other	3

Management

Computer and Information Systems Managers	24,733
Architectural and Engineering Managers	9,122
Construction Managers	9,118
Purchasing Managers	7,199
Industrial Production Managers	4,925
Quality Control Systems Managers	3,374
Natural Sciences Managers	2,342
Transportation, Storage, and Distribution Managers	44
Water Resource Specialists	17
Biofuels Production Managers	4
Hydroelectric Production Managers	2
Biofuels/Biodiesel Technology and Product Development Managers	1
Geothermal Production Managers	1

Office and Administrative Support

Shipping, Receiving, and Inventory Clerks	10,666
Production, Planning, and Expediting Clerks	7,324
Cargo and Freight Agents	1,345
Procurement Clerks	201
Meter Readers, Utilities	184
Desktop Publishers	19
Communications Equipment Operators, All Other	11

Production

First-Line Supervisors of Production and Operating Workers	41,998
Production Workers, All Other	26,199
Inspectors, Testers, Sorters, Samplers, and Weighers	8,300
Assemblers and Fabricators, All Other	7,463
Helpers--Production Workers	4,691
Machinists	3,678
Packaging and Filling Machine Operators and Tenders	3,627
Painting, Coating, and Decorating Workers	3,272
Electrical and Electronic Equipment Assemblers	2,590
Water and Wastewater Treatment Plant and System Operators	1,290
Team Assemblers	1,186
Mixing and Blending Machine Setters, Operators, and Tenders	782
Ophthalmic Laboratory Technicians	650
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	566
Stationary Engineers and Boiler Operators	507
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	442
Electromechanical Equipment Assemblers	430
Power Plant Operators	354
Chemical Plant and System Operators	335
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	285
Cutting and Slicing Machine Setters, Operators, and Tenders	180
Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	157
Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	154
Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	122
Paper Goods Machine Setters, Operators, and Tenders	107
Chemical Equipment Operators and Tenders	100
Gas Plant Operators	98
Power Distributors and Dispatchers	94
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	91

Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	91
Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	89
Plant and System Operators, All Other	86
Sawing Machine Setters, Operators, and Tenders, Wood	85
Adhesive Bonding Machine Operators and Tenders	72
Petroleum Pump System Operators, Refinery Operators, and Gaugers	71
Photographic Process Workers and Processing Machine Operators	67
Semiconductor Processing Technicians	65
Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	61
Prepress Technicians and Workers	57
Plating Machine Setters, Operators, and Tenders, Metal and Plastic	49
Metal-Refining Furnace Operators and Tenders	34
Nuclear Power Reactor Operators	32
Structural Metal Fabricators and Fitters	29
Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	28
Model Makers, Metal and Plastic	27
Grinding and Polishing Workers, Hand	26
Cooling and Freezing Equipment Operators and Tenders	23
Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	23
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	22
Cabinetmakers and Bench Carpenters	20
Coil Winders, Tapers, and Finishers	18
Engine and Other Machine Assemblers	15
Layout Workers, Metal and Plastic	14
Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	12
Pourers and Casters, Metal	12
Fabric and Apparel Patternmakers	11
Forging Machine Setters, Operators, and Tenders, Metal and Plastic	11
Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	10
Cutters and Trimmers, Hand	8
Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	8
Tool Grinders, Filers, and Sharpeners	8
Foundry Mold and Coremakers	5
Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	4
Etchers and Engravers	4
Glass Blowers, Molders, Benders, and Finishers	4
Patternmakers, Metal and Plastic	4
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	4
Biofuels Processing Technicians	3
Model Makers, Wood	1
Woodworkers, All Other	1

Transportation and Material Moving

Heavy and Tractor-Trailer Truck Drivers	45,171
Light Truck Drivers	44,787
Laborers and Freight, Stock, and Material Movers, Hand	32,610
Industrial Truck and Tractor Operators	14,982
Packers and Packagers, Hand	2,756
Motor Vehicle Operators, All Other	668
Commercial Pilots	594
Railroad Conductors and Yardmasters	533
Air Traffic Controllers	383
Traffic Technicians	371
Aviation Inspectors	348
Airline Pilots, Copilots, and Flight Engineers	293
Material Moving Workers, All Other	279
Crane and Tower Operators	249
Machine Feeders and Offbearers	241
Sailors and Marine Oilers	148
Ship Engineers	76
Airfield Operations Specialists	66
Bridge and Lock Tenders	37
Conveyor Operators and Tenders	33
Locomotive Engineers	27
Dredge Operators	12
Gas Compressor and Gas Pumping Station Operators	11
Motorboat Operators	11
Hoist and Winch Operators	5
Pump Operators, Except Wellhead Pumpers	3
Captains, Mates, and Pilots of Water Vessels	2
Rail Transportation Workers, All Other	1
Tank Car, Truck, and Ship Loaders	1
Transportation Inspectors	1

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